Chaparral ENERGY

Nov 08, 2012

Mr. Ray Leissner
US Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

Re: Monitor Well Sampling
Area Permit- CO2 Phase I
North Burbank Unit
Osage County, Oklahoma

Dear Mr. Leissner:

Enclosed is the "Groundwater Sampling Report" along with the Appendix's (A,B & C). As the Area permit stated, this first sampling results from each monitor well in Phase I allow to establish baseline groundwater quality for all the monitor wells.

If you have any questions or need more data, please contact us at the address listed.

Sincerely,
Chaparral Energy,L.L.C.

Erwin Pino

Erwin Pino
Regulatory Engineer
Direct Number: (405) 426-4081
Direct Fax: (405) 425-8681
E-Mail: erwin.pino@chaparralenergy.com

Cc: Mr. Arnold Bierschenk, EPA Region 6, Dallas, Texas w/o enclosures

Environmental Testing Inc. 488-2400
4619 N. Santa Fe, OKC, OK 73118 - (405) 488-2400 - (405) 488-2404 fax

Analytical Report

Report Date: 11/01/2012
Order # 2012100447

Laboratory Certificate # 7211

Client: **Mr. Robert Keyes**
Associated Environmental Industries Corp.
P.O. Box 5306
3205 Bart Conner Drive
Norman, OK 73070

Project: **Webb City**

Analytical Results

Client Sample ID: **MW-1** ETI ID: **1**
Sample Collected : **10/22/2012 @ 14:48** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	460	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	6010	mg/L	10/29/2012 02:51:00 PM	DS	300.0
Total Dissolved Solids	13000	mg/L	10/25/2012 05:05:00 PM	DS	2540 C

Client Sample ID: **MW-2** ETI ID: **2**
Sample Collected : **10/22/2012 @ 16:15** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	286	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	1420	mg/L	10/29/2012 03:08:00 PM	DS	300.0
Total Dissolved Solids	3430	mg/L	10/25/2012 05:05:00 PM	DS	2540 C

Client Sample ID: **MW-3** ETI ID: **3**
Sample Collected : **10/22/2012 @ 17:08** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	1390	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	589	mg/L	10/29/2012 03:25:00 PM	DS	300.0
Total Dissolved Solids	2720	mg/L	10/25/2012 05:05:00 PM	DS	2540 C

Analytical Results

Client Sample ID: MW-4 ETI ID: 4
Sample Collected : 10/23/2012 @ 08:20 Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	2360	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	2220	mg/L	10/29/2012 04:00:00 PM	DS	300.0
Total Dissolved Solids	6910	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: MW-5 ETI ID: 5
Sample Collected : 10/23/2012 @ 09:09 Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	860	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	1770	mg/L	10/29/2012 04:17:00 PM	DS	300.0
Total Dissolved Solids	5230	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: MW-7 ETI ID: 6
Sample Collected : 10/23/2012 @ 09:54 Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	1750	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	296	mg/L	10/29/2012 04:35:00 PM	DS	300.0
Total Dissolved Solids	2590	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: Blank (1) ETI ID: 7
Sample Collected : 10/23/2012 @ 08:30 Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	4.00	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	<0.160	mg/L	10/29/2012 04:52:00 PM	DS	300.0
Total Dissolved Solids	<35.0	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: MW-6 ETI ID: 8
Sample Collected : 10/23/2012 @ 10:36 Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	465	mg/L	10/25/2012 02:40:00 PM	DS	2320B
Chloride	387	mg/L	10/29/2012 05:09:00 PM	DS	300.0
Total Dissolved Solids	1230	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Analytical Results

Client Sample ID: **MW-8** ETI ID: **9**

Sample Collected : **10/23/2012 @ 11:33** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	352	mg/L	10/30/2012 02:20:00 PM	DS	2320B
Chloride	2090	mg/L	10/29/2012 05:27:00 PM	DS	300.0
Total Dissolved Solids	4980	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: **MW-9** ETI ID: **10**

Sample Collected : **10/23/2012 @ 12:31** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	508	mg/L	10/30/2012 02:20:00 PM	DS	2320B
Chloride	852	mg/L	10/29/2012 05:44:00 PM	DS	300.0
Total Dissolved Solids	2420	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: **MW-10** ETI ID: **11**

Sample Collected : **10/23/2012 @ 13:31** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	60.0	mg/L	10/30/2012 02:20:00 PM	DS	2320B
Chloride	1140	mg/L	10/29/2012 06:01:00 PM	DS	300.0
Total Dissolved Solids	2550	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: **MW-10 Duplicates** ETI ID: **12**

Sample Collected : **10/23/2012 @ 13:31** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	56.0	mg/L	10/30/2012 02:20:00 PM	DS	2320B
Chloride	1080	mg/L	10/29/2012 06:18:00 PM	DS	300.0
Total Dissolved Solids	2590	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Client Sample ID: **MW-11** ETI ID: **13**

Sample Collected : **10/23/2012 @ 14:55** Matrix: **Aqueous**

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	358	mg/L	10/30/2012 02:20:00 PM	DS	2320B
Chloride	246	mg/L	10/29/2012 08:20:00 PM	DS	300.0
Total Dissolved Solids	1590	mg/L	10/29/2012 05:15:00 PM	DS	2540 C

Analytical Results

Client Sample ID: MW-12 — ETI ID: 14
Sample Collected : 10/23/2012 @ 15:32 — Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	1310	mg/L	10/30/2012 02:20:00 PM	DS	2320B
Chloride	616	mg/L	10/29/2012 09:11:00 PM	DS	300.0
Total Dissolved Solids	2810	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-13 — ETI ID: 15
Sample Collected : 10/23/2012 @ 16:09 — Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	1190	mg/L	10/30/2012 02:20:00 PM	DS	2320B
Chloride	304	mg/L	10/29/2012 09:29:00 PM	DS	300.0
Total Dissolved Solids	2130	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-15 — ETI ID: 16
Sample Collected : 10/23/2012 @ 16:58 — Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	238	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	3770	mg/L	10/29/2012 09:46:00 PM	DS	300.0
Total Dissolved Solids	7790	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-14 — ETI ID: 17
Sample Collected : 10/23/2012 @ 17:47 — Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	618	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	3310	mg/L	10/29/2012 10:03:00 PM	DS	300.0
Total Dissolved Solids	7790	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-16 — ETI ID: 18
Sample Collected : 10/24/2012 @ 07:45 — Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	312	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	5490	mg/L	10/29/2012 10:21:00 PM	DS	300.0
Total Dissolved Solids	11700	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Analytical Results

Client Sample ID: Blank (2)
Sample Collected : 10/24/2012 @ 07:49
ETI ID: 19
Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	2.00	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	<0.160	mg/L	10/30/2012 11:42:00 AM	DS	300.0
Total Dissolved Solids	56.0	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-19
Sample Collected : 10/24/2012 @ 08:35
ETI ID: 20
Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	2480	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	360	mg/L	10/30/2012 12:00:00 PM	DS	300.0
Total Dissolved Solids	3130	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-19D
Sample Collected : 10/24/2012 @ 08:35
ETI ID: 21
Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	2410	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	362	mg/L	10/30/2012 12:17:00 PM	DS	300.0
Total Dissolved Solids	3280	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-18
Sample Collected : 10/24/2012 @ 09:23
ETI ID: 22
Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	2020	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	286	mg/L	10/29/2012 11:30:00 PM	DS	300.0
Total Dissolved Solids	2620	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Client Sample ID: MW-17
Sample Collected : 10/24/2012 @ 09:52
ETI ID: 23
Matrix: Aqueous

Parameter	Result	Units	Analyzed On	Analyst	Method
Alkalinity, T	332	mg/L	10/31/2012 10:15:00 AM	DS	2320B
Chloride	3510	mg/L	10/30/2012 12:04:00 AM	DS	300.0
Total Dissolved Solids	7800	mg/L	10/29/2012 05:45:00 PM	DS	2540 C

Respectfully Submitted:

Russell Britten
President

Unless ETI receives prior notification, all sample material not consumed in analysis will be retained for a period of 30 days before disposal.

Project #: 2012100447

Groundwater Sampling Report
Chaparral Energy
Osage County, Oklahoma

Prepared For:
Chaparral Energy
373 Phillips Rd
Shidler, Oklahoma

Prepared By:
Associated Environmental Industries
3205 Bart Conner Dr.
Norman, Oklahoma 73072
405-360-1434

November 08, 2012

INTRODUCTION

Chaparral Energy was requested by the EPA to implement a groundwater sampling plan to monitor the affects, if any, of activities to be implemented by Chaparral Energy. This sampling event was implemented to establish a baseline condition/quality of the groundwater in these areas. The purpose of this report is to present the data, which will represent the background/baseline data, for these monitor wells and the groundwater quality/conditions in these areas.

MONITOR WELL NETWORK

The monitor well network consists of nineteen (19) monitor wells. The site area includes: the SE/4 of Section 10, the S/2 of Section 11, the SW/4 of Section 12, all of Section 14, and the N/2 of Section 23, all in Township 27N, Range 5E, Osage County, Oklahoma; and any subsequently expanded area due to modification of the existing permit areas, which require additional monitor wells. The following table (Table 1) summarizes the details for the groundwater monitor network that was sampled.

Table 1: Groundwater Monitor Well Network Details

Well ID	Location	Diameter (in)	Depth (ft)	Screen Interval (ft)	Construction
MW-1	NWNWSE, Sec 2, T27N, R5E	4	250	220 - 240	PVC
MW-2	NENESE, Sec 11, T27N, R5E	4	250	230 - 250	PVC
MW-3	SESENW, Sec 11, T26N, R5E	4	290	240 - 280	PVC
MW-4	NWNWSW, Sec 11, T27N, R5E	4	215	175 - 215	PVC
MW-5	NWNWSE, Sec 10, T27N, R5E	4	240	200 - 240	PVC
MW-6	NWNWNE, Sec 15, T27N, R5E	4	280	240 - 270	PVC
MW-7	NWNWNW, Sec 14, T27N, R5E	4	244	204 - 234	PVC
MW-8	NWNWNE, Sec 14, T27N, R5E	4	190	150 - 180	PVC
MW-9	NENENE, Sec 14, T27N, R5E	4	186	146 - 176	PVC
MW-10	SWSWSE, Sec 12, T27N, R5E	4	254	224 - 254	PVC
MW-11	NENESE, Sec 14, T27N, R5E	4	180	140 - 170	PVC
MW-12	SESENW, Sec 14, T27N, R5E	4	210	180 - 200	PVC
MW-13	SWSWNW, Sec 14, T27N, R5E	4	240	200 - 230	PVC
MW-14	NWNWNW, Sec 23, T27N, R5E	4	245	205 - 235	PVC
MW-15	NENENW, Sec 23, T27N, R5E	4	254	234 - 254	PVC
MW-16	NWNWNW, Sec 23, T27N, R5E	4	160	120 - 150	PVC
MW-17	SESENE, Sec 23, T27N, R5E	4	148	108 - 138	PVC
MW-18	SESENW, Sec 23, T27N, R5E	4	186	146 -176	PVC
MW-19	SESENE, Sec 22, T27N, R5E	4	198	158 - 188	PVC

GROUNDWATER SAMPLING

Groundwater samples were collected from the nineteen (19) monitor wells following the previously approved procedures. Activities which occurred during groundwater sampling are summarized as follows:

- pre-arrangement of sample analytical requests with analytical testing laboratory
- assembly and preparation of sampling equipment and supplies
- groundwater sampling
  - determine sample type (i.e. composite or grab), frequency and number of samples, and proper sampling containers
  - inspection of well
  - water-level measurements
  - well depth measurement
  - calculation of purge volume
  - well evacuation
  - sampling
- sample preservation and shipment
  - sample preparation
  - on-site measurement of parameters
  - sample labeling including date, time, location, sampler's initials, analyses, and tracking number
- completion of sample records (field log book)
- completion of chain-of-custody records
- sample shipment

Detailed sampling procedures are presented in the "Groundwater Sampling and Analysis Plan", Appendix A, and in the "Quality Assurance Project Plan", Appendix B.

Monitor Well Sampling

Typically, the water standing in a well prior to sampling is removed. But do to the extremely low flow nature (~1/4 gpm) of the formation, a low-flow well purge/sampling approach was used at

this site to obtain a representative sample. A grundfos (or similar) pump was lowered to the center (vertically) of each well screen. The well water was evacuated at the lowest possible rate of the pump, and approximately 10 to 15 gallons of water was evacuated. A sample was collected from the water stream.

During purging/sampling, pH, conductivity, and temperature measurements were taken and recorded as a check that the water quality in the well had stabilized. A sample was collected after 2, 5, and 10 (and in some cases 15) gallons of purging for these analyses. All purged groundwater was containerized in steel 55-gallon drums and managed in accordance with state and federal regulations.

During groundwater collection, no equipment or lifting lines was allowed to contact the ground. If equipment or lifting lines contacts the ground, they were replaced or re-cleaned prior to use.

On-Site Parameter Measurement

Certain chemical and physical parameters in water can change significantly within a short time of sample acquisition. These parameters cannot be accurately measured in a laboratory located more than a few hours from the Facility, and so were measured on-site with portable equipment. Examples of these parameters are:

- pH;
- specific conductance; and
- temperature;

Measurement of these parameters were obtained from unfiltered, unpreserved, "fresh" water collected by the same technique as the samples taken for laboratory analyses. The measurements were made in a clean glass container separate from those intended for laboratory analysis. The measured values were recorded in the field log book.

These water quality indicator parameters were used to determine well purge volumes to assure the sample was representative of formation water, and not of the stagnant casing water. Stabilized water quality indicator parameter values, after purging of the casing volume, indicate representative formation water.

Groundwater Field Parameters/Measurements

The groundwater sampling program included the following measurements at each well.

- water level (ft toc)
- well depth (ft)
- air temperature
- weather conditions
- groundwater pH
- groundwater temperature
- groundwater specific conductivity

The following list summarizes this data.

MW-1

Water Level (ft. toc) – 123.87
Total Depth (ft.) – 240
Air Temperature (°F) – 79.8
Weather Conditions – cloudy, windy
pH - @2 gallons = 8.57, @5 gallons = 8.59, @10 gallons = 8.64
Conductivity (mS) - @2 gallons = 19.41, @5 gallons = 19.24, @10 gallons = 19.50
Temperature (°F) - @2 gallons = 73.2, @5 gallons = 70.7, @10 gallons = 69.8
Sample Time – October 22, 2012/14:48 pm
Sample Depth (ft.) – 230
Sample Condition - clear
Notes:

MW-2

Water Level (ft. toc) – 117.41
Total Depth (ft.) – 250
Air Temperature (°F) – 76.4
Weather Conditions – cloudy, windy
pH - @2 gallons = 7.72, @5 gallons = 7.66, @10 gallons = 7.62
Conductivity (mS) - @2 gallons = 7.94, @5 gallons = 6.38, @10 gallons = 6.31
Temperature (°F) - @2 gallons = 71.4, @5 gallons = 68.0, @10 gallons = 68.0
Sample Time – October 22, 2012/16:15 pm
Sample Depth (ft.) – 240
Sample Condition – clear, possible sulfur odor
Notes:

MW-3

Water Level (ft. toc) – 131.68
Total Depth (ft.) – 290
Air Temperature (°F) – 74.3
Weather Conditions – cloudy, windy
pH - @2 gallons = 11.94, @5 gallons = 12.12, @10 gallons = 12.14, @15 gallons = 12.17
Conductivity (mS) - @2 gallons = 7.82, @5 gallons = 8.01, @10 gallons = 8.14, @15 gallons = 8.28
Temperature (°F) - @2 gallons = 70.3, @5 gallons = 66.9, @10 gallons = 66.7, @15 gallons = 66.9
Sample Time – October 22, 2012/17:08 pm
Sample Depth (ft.) – 260
Sample Condition – clear
Notes:

MW-4

Water Level (ft. toc) – 62.73
Total Depth (ft.) – 215
Air Temperature (°F) – 66.5
Weather Conditions – cloudy, windy
pH - @2 gallons = 12.13, @5 gallons = 12.18 @10 gallons = 12.25, @15 gallons = 12.25
Conductivity (mS) - @2 gallons = 13.96, @5 gallons = 116.70, @10 gallons = 16.65, @15 gallons = 16.4
Temperature (°F) - @2 gallons = 67.6, @5 gallons = 66.2, @10 gallons = 65.6, @15 gallons = 65.4
Sample Time – October 23, 2012/8:20 am
Sample Depth (ft.) – 195
Sample Condition – clear, possible sulfur odor